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10 CFR § 50.73  
L-2010-266

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D. C. 20555-0001

Re: Turkey Point Unit 4  
Docket No. 50-251  
Reportable Event: 2010-006-00  
Date of Event: September 21, 2010  
Automatic Reactor Trip Due to Spurious  
High Pressurizer Pressure Trip Signal

The attached Licensee Event Report 05000251/2010-006-00 is being submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) due to a valid actuation of the Reactor Protection System.

If there are any questions, please call Mr. Robert Tomonto, Licensing Manager at 305-246-7327.

Sincerely,

Michael Kiley  
Vice President  
Turkey Point Nuclear Plant

Attachment

SM

cc: Regional Administrator, USNRC, Region II  
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

IE22  
NRK

<b>NRC FORM 366</b> (10-2010)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>		APPROVED BY OMB: NO. 3150-0104		EXPIRES: 10/31/2011																																						
<b>LICENSEE EVENT REPORT (LER)</b>																																												
<b>1. FACILITY NAME</b> Turkey Point Unit 4				<b>2. DOCKET NUMBER</b> 05000251		<b>3. PAGE</b> 1 of 4																																						
<b>4. TITLE</b> Automatic Reactor Trip Due to Spurious High Pressurizer Pressure Trip Signal																																												
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>																																						
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<b>9. OPERATING MODE</b>  <div style="text-align: center; font-size: 1.2em;">1</div>			<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)</b>																																									
<b>10. POWER LEVEL</b>  <div style="text-align: center; font-size: 1.2em;">100%</div>			<table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td></td> </tr> </table>						<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	
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Specify in Abstract below or in NRC Form 366A																																												
<b>12. LICENSEE CONTACT FOR THIS LER</b>																																												
NAME <div style="text-align: center; font-size: 1.1em;">Stavroula Mihalakea</div>						TELEPHONE NUMBER (Include Area Code) <div style="text-align: center; font-size: 1.1em;">(305) 246-6454</div>																																						
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>																																												
CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX																																			
<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO					<b>15. EXPECTED SUBMISSION DATE</b>																																							
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<b>ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)</b>																																												
<p>On September 21, 2010, at approximately 2017, with Turkey Point Unit 4 operating at 100% power, an unplanned automatic reactor trip occurred while the quarterly surveillance for the Channel II High Pressurizer Pressure Protection Loop (P-4-456) was in progress. The cause of the trip was attributed to Channel I spurious trip signal of the High Pressurizer Pressure Protection Loop (P-4-455) coincident with Channel II being already tripped due to the surveillance procedure. All rods fully inserted and all systems responded as designed and the unit was stabilized in Mode 3. At 2228, a report (EN#46265) was made to the NRC per 10 CFR 50.72(b)(2)(iv)(B) for actuation of Reactor Protection System with the reactor critical and per 10 CFR 50.72(b)(3)(iv)(A) for actuation of the Auxiliary Feedwater System. Excessive separation found in the electrical bifurcated pins of the ELCO connectors of the NUS instrument Comparator (PC-4-455A) module caused the Channel I spurious trip signal. Corrective actions include replacement of Comparator PC-4-455A, providing formal training for Maintenance personnel to properly inspect NUS modules with ELCO connectors, adding quantitative criteria in site procedures to perform connector inspection, and inspecting other NUS module connectors installed at the plant that could have electrical pins with excessive separation.</p>																																												

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## NARRATIVE

**Description of the Event**

On September 21, 2010, at approximately 2017, with Turkey Point Unit 4 operating at 100% power, an unplanned automatic reactor trip occurred during the performance of the quarterly surveillance of the Channel II Reactor Protection System [JC] Pressurizer Pressure Protection Loop P-4-456. Following the reactor trip, all systems responded as designed and the unit was stabilized in Mode 3 on normal off-site power. Auxiliary Feedwater automatically initiated when Steam Generator (SG) levels lowered below the actuation setpoint. When SG levels were stabilized within the normal operating band of Mode 3, Auxiliary Feedwater was secured. No significant equipment issues or human performance issues associated with this trip were identified.

At 2228, a four hour report (EN#46265) was made to Nuclear Regulatory Commission Operations Center (NRCOC) in accordance with requirements of 10 CFR 50.72(b)(2)(iv)(B) for actuation of the Reactor Protection System with the reactor critical and 10 CFR 50.72(b)(3)(iv)(A) for actuation of the Auxiliary Feedwater System. This event was entered into the Corrective Action Program as AR 00581322.

After initial investigation and troubleshooting, it was determined that the reactor trip was attributed to a spurious trip signal from the Pressurizer [PRZ] Pressure Protection Loop Channel I, concurrent with Channel II Pressurizer Pressure Loop bistables already being tripped by the surveillance procedure. The intermittent connections due to electrical bifurcated pin separation found in the ELCO connectors of the NUS instrument module Comparator (PC-4-455A) caused the Channel I spurious trip signal. The High Pressurizer Pressure Channel I, Comparator PC-4-455A was replaced and Turkey Point Unit 4 returned to power on September 24, 2010.

**Analysis of the Event**

Evaluation of performance and condition of the Pressurizer Pressure Loops is observed quarterly during the performance of the Pressurizer Pressure Loops testing. Protection channels are designed with sufficient redundancy for individual channel calibration and tests to be made during power operation without degrading the reactor protection. In general, removal of the channel for calibration/surveillance is accomplished by placing the channel in partial trip-mode. A two out of three channel becomes a one out of two channel. Testing will not cause a trip unless a trip condition exists in a concurrent channel.

A review of the sequence of events (SOE) recorder report identified a two out of three Pressurizer High Pressure Trip signal ("2/3 PRZ HI-LO PRESS TRIP) and actuation of the protection relays RT-7 and RT-8. The actuation of protection relays RT-7 and RT-8 indicate that the event was isolated to the High Pressurizer Pressure channels (P-4-455/456/457). The Pressurizer High Pressure protection circuit trips the reactor on coincidence of two out of three channels with a trip setpoint of 2385 psig increasing. At the time of the trip, Maintenance personnel were performing the Channel II Pressurizer Pressure Loop (P-4-456) testing per procedure 4-SMI-041.10, "Pressurizer Pressure Protection Loops Analog Test." In accordance with this procedure, the associated Channel II Loop P-4-456 bistables were tripped in preparation for testing of this channel. Since Channel II was already in a tripped condition due to the surveillance procedure, the trip logic was reduced to one of the two remaining Channels I or III (i.e., loops P-4-455 or P-4-457).

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As part of the event investigation, the surveillance procedure 4-SMI-041.10 was re-performed again on Channel II (Pressurizer Pressure Loop P-4-456). During the performance of this procedure, Channel I alarm came in and reset repeatedly. Based on this information, it was concluded that the Unit 4 reactor trip event was attributed to a spurious trip of Channel I concurrent with Channel II already being tripped due to the surveillance procedure.

Several potential causes were evaluated as part of the root cause investigation. Review of operating experience at Turkey Point identified that activities associated with the NUS Instruments Module replacement project have resulted in connector pin separation that have challenged component operation. As part of the investigation, the team inspected Channel I NUS Instrument Module Comparator PC-4-455A and found pins with excessive separation in the ELCO connectors that caused the Channel I spurious trip signal.

The original Pressurizer Pressure Protection instrument Loop Hagan Modules were replaced by NUS Instruments Modules in 2008. The original ELCO connectors in the instrument loop rack wiring were not replaced. The two halves of the ELCO connector are provided with keyed alignment guides such that the two halves of the connectors can only be mated in the designed configuration. The ELCO connector electrical pins are very small and the design distance between these bifurcated pins is approximately 10 mils. Inspection of these pins in the instrument loop racks could be challenging due to the location of the connectors in the rack, the area lighting, and the quality of vision of the individual performing the inspection. This is especially true for the pins of cable end connector [CBL,con] that are recessed in the connector housing. These electrical pins provide an audible snap when properly installed in the connector. They are held in tight alignment for connection with the mating half. The guide pins help to ensure that the electrical pins are aligned before engagement. The connector jackscrew ensures the connector halves are tight.

ELCO connector electrical pins can be damaged during mating of the connector halves if care is not taken to ensure that the pins and connectors are aligned properly. Connector pins can also be damaged by the jackscrew during installation, if it is not properly installed and aligned.

The original NUS module replacement modification did not include any special instruction for installation or inspection for electrical pins of the connectors. When the excessive pin separation concerns were identified in 2008, an inspection sheet with visual inspection criteria was developed and included in all NUS module work order instructions for installation/replacement of an NUS instrument module to address the knowledge gap that existed for not recognizing that excessive pin separation could cause operational failures.

The inspection criterion was inadequate for field rack conditions because it was based on a qualitative visual inspection and judgment for validating such a critical pin dimension. The acceptance criteria and method of verification were not adequately addressed. Additionally, the instruction sheet for excessive pin separation inspection was briefed only to a limited number of Maintenance personnel. There was no formal training developed and presented for identifying pin separation. The actions taken have not been effective in preventing the cause of excessive pin separation in ELCO connectors or identifying the damaged pins once separation has occurred.

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**NARRATIVE**

**Cause of the Event**

The root cause of the event is excessive pin separation in ELCO connectors which is causing component failures due to inadequate installation instructions and inspection criteria. A contributing cause is that the modification implementation instruction contains no special installation instruction with respect to pin separation in ELCO connectors.

**Reportability**

The event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) due to any event or condition that resulted in an automatic actuation of the Reactor Protection System when an unplanned reactor trip occurred during the performance of the Pressurizer Pressure Protection Loop surveillance. This event is also reportable in accordance with 10 CFR 50.73(a)(2)(iv)(B) due to automatic actuation of the Auxiliary Feedwater System.

**Analysis of Safety Significance**

This event resulted in an automatic reactor trip due to an erroneous High Pressurizer Pressure signal and was followed by an automatic turbine trip on reactor trip. The plant responded as expected to the automatic trip. The Auxiliary Feedwater system actuated on the low steam generator level as designed and the plant was stabilized in Mode 3. No significant equipment or human performance issues were identified. There were no adverse effects on plant parameters and the health and safety of the public was not compromised nor adversely affected.

**Corrective Actions**

1. Immediate corrective actions included the replacement of NUS Instruments Comparator Module PC-4-455A.
2. ELCO connector inspection requirements will be added to a plant procedure.
3. Formal training will be conducted for Maintenance personnel to properly inspect NUS module ELCO connector pins and to properly mate the ELCO connectors.
4. NUS modules with ELCO connectors will be inspected during the next scheduled preventive maintenance activity.

Corrective actions to address the event's root cause and contributing factors have been entered in the Turkey Point Corrective Action Program in AR 00581322.

**Additional Information:**

EIIS Codes are shown in the format [IEEE system identifier, component function identifier, second component function identifier (if appropriate)]

Condition Report AR 00581322 was initiated to evaluate this event.

**Similar Events:** None

**Failed Components:** Reactor Protection System Component Identification: Pressurizer Pressure Protection Loop-Comparator NUS Instruments Module (PC-4-445A)-ELCO Connector pins.